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A SYSTEM AND METHOD FOR HOST BASED STORAGE VIRTUALIZATION

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A SYSTEM AND METHOD
FOR HOST BASED STORAGE VIRTUALIZATION

5 **Field of the Invention**

The illustrative embodiment of the present invention relates generally to network storage and more particularly to a host based storage method utilizing a virtual interface between a host electronic device and network storage mediums.

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Background of the Invention

As the use of computers and computer networks has grown, so has the need for data storage. Duplicate copies of important data must be saved or "backed up" so that in the event of hardware or software failure the data is not lost. Additionally, large amounts of original data often must be saved in locations other than where the data is generated due to storage size considerations. Conventional methods of storing data have evolved from host based methods of storing data (i.e., copying data to multiple files and/or multiple disk drives on the same system) to network based storage solutions that store data at sites remote from the host.

A conventional network based storage system includes a volume controller and a multitude of storage mediums under the control of the volume controller. A volume is a storage medium partition which includes a table of contents listing all of the files stored in the partition. A storage medium may have more than one partition. A volume controller is a device used to send commands to the volumes in the storage system (i.e.: it enables access to the data in the volumes). The storage mediums are usually a collection of disk drives gathered in a single apparatus, such as a RAID system (RAID is an acronym for Redundant Array of Inexpensive/Independent Disks).

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Most network storage systems are designed to attempt to provide continual access to data and continual protection of data. Unfortunately, the twin goals of protection and uninterrupted access sometimes conflict. In conventional network storage systems, the repair process to address hardware failure in the system interrupts access to data. Conventionally, a database or file system sends a collection of data over a network to a volume controller for storage. The volume controller sends the data to the storage mediums. This method of relying upon the volume controller to decide

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where to physically store data requires the proper functioning of the storage elements of the system.

If a device holding a storage medium fails, the volume controller attempts to
5 recover from the failure by locating and activating a spare drive ("spindle"). During
the process of substituting a spare spindle for the failed storage medium, access to data
is interrupted during the activating of the spindle and the copying of data to the spindle.
If there is not a spare spindle that is locatable by the volume controller, the data in the
storage system may be unprotected and/or inaccessible depending upon the type of
10 storage system being employed. Likewise, in network storage systems which leave the
determination of the ultimate storage destination of data to an element in the network
(i.e.: software on a switch or other device remote from the host electronic device) the
data is similarly inaccessible during network storage system repairs. Similar delays in
access to data accompany the re-configuration of the storage mediums used in the
15 network storage system. Users, such as a file system or database, which are directly
interfaced with the storage system are required in conventional network storage systems
to wait for data access during the reconfiguration and repair of the storage system.

Summary of the Invention

20 The illustrative embodiment of the present invention provides a method of
inserting a virtual layer between the user of a host electronic device and a network
storage medium. The virtual layer wraps a real volume of storage (i.e.: a logical unit)
inside a virtual volume. The virtual logical unit (VLUN) is a software created virtual
25 interface that encapsulates and hides some aspects of the real volume. One of the
hidden attributes is the location of the real volume. The VLUN is implemented as a
pseudo-device situated between the real volume and the user of the data in the volume.
All accesses to the data in the real volume pass through the VLUN. By providing a
virtual layer between the user and the network storage system, reconfiguration and
30 repair of the storage system may be undertaken with minimal disruption of data access
to the user.

The hiding of the real volume enables real-time data relocation. A user seeking
access to the data through the VLUN is unaware of the actual location of the data. As
35 long as the virtual interface (the VLUN) remains in an accessible location, the actual
location of the data is irrelevant to the user. This allows the data to be moved around in